

***Elphidium excavatum (Terquem): paleobiological and statistical investigations of infraspecific variation***

A.A.L. Miller, Department of Geology,  
F.S. Medioli, Centre for Marine Geology,  
D.C. Hamilton, Department of Mathematics, Statistics, and Computing Science,  
Dalhousie University, Halifax, N.S. B3H 3J5

Detailed study of large sympatric populations and fossil assemblages of the highly variable species *Elphidium excavatum* (Terquem) collected from 20 widely spaced localities indicates that a variety of morphotypes of *Elphidium* can be linked to one another in a number of interlocking intergradational series. Ten morphotypes are recognized and grouped as formae (ecophenotypes) of *Elphidium excavatum* (Terquem); these morphotypes were previously considered as 22 independent taxa by various authors.

To test the hypothesis that these ecophenotypes are distinct morphologically, the ten ecophenotypes were separated into groups based on differences in external morphology; 15 of the characters by which the groups are distinguished were measured and or scored on 721 individuals (11-163 per forma). Discriminant and classification functions were calculated from these character measurements using the SPSS computer program DISCRIMINANT. To illustrate the derivation of these functions, two examples (2 groups and 2 variables; 3 groups and

variables), were calculated and explained step by step using the MINITAB interactive statistical package.

Fifteen analyses, using either one sample or split sample approaches, and simultaneous or stepwise analytic methods, classify 84-90% of the specimens into the subjectively defined formae to which they were assigned. Either morphotype (forma) or location was treated as the dependent variable. The analyses showed that there is no

strong relationship between formae and geographic location, thus strengthening the subjective conclusion that these are ecophenotypes and not subspecies.

Although all of these formae belong to the same species, it is suggested that the distinction among them should be retained because of their potential as a valuable interpretive tool in paleo-ecological and biostratigraphic studies of Holocene and Pleistocene sediments.